CLAIMS

1. An active learning method using a storage device for storing a set of known data and a set of unknown data, and a plurality of learning machines, said known data being data having known label values, and said unknown data being data having unknown label values, said method comprising the steps of:

said plurality of learning machines sampling the known data from said storage device independently of one another, and thereafter learning the known data;

integrating and delivering output results of said plurality of learning machines as a result of the learning;

said plurality of learning machines retrieving unknown data from said storage device to make a prediction;

calculating and delivering data to be next learned based on the result of the prediction;

entering a label value corresponding to the data to be next learned; and

deleting the data, the label value of which has been entered, from the set of unknown data, and adding the data to the set of known data,

wherein non-uniform weighting is performed at least one of when the known data is sampled, when the results of the learning by said plurality of learning machines are integrated, and when the data to be next learned is calculated from the predictions by said plurality of learning machines.

2. The active learning method according to claim 1, further

comprising the step of dividing the known data and the unknown data into groups, wherein data are selected to disperse over groups when the data to be next learned is calculated.

3. The active learning method according to claim 1, further comprising the step of dividing the known data and the unknown data into groups, wherein the unknown data are supplied to said each learning machine such that the unknown data disperse over groups.

4. An active learning system comprising:

a storage device for storing a set of known data and a set of unknown data, said known data being data having known label values, and said unknown data being data having unknown label values;

a plurality of learning machines for learning the known data and predicting the unknown data;

a plurality of sampling devices provided for each of said learning machines for sampling the known data from said storage device and supplying the sampled data to said learning machines corresponding thereto;

first integrating means for integrating results of learning performed by said respective learning machines based on the known data;

second integrating means for calculating data to be next learned from results of the predictions performed by said respective learning machines based on the unknown data, and delivering the data to be next learned;

result input means for entering a label value corresponding to the data to be next learned;

control means for deleting the data, the label value of which has been

entered, from the set of unknown data, and adding the data to the set of known data; and

sampling weighting means for setting a weight at the time of sampling for each of said sampling devices.

5. An active learning system comprising:

a storage device for storing a set of known data and a set of unknown data, said known data being data having known label values, and said unknown data being data having unknown label values;

a plurality of learning machines for learning the known data and predicting the unknown data;

a plurality of sampling devices provided for each of said learning machines for sampling the known data from said storage device and supplying the sampled data to said learning machines corresponding thereto;

first integrating means for integrating results of learning performed by said respective learning machines based on the known data;

second integrating means for calculating data to be next learned from results of the predictions performed by said respective learning machines based on the unknown data, and delivering the data to be next learned;

result input means for entering a label value corresponding to the data to be next learned;

control means for deleting the data, the label value of which has been entered, from the set of unknown data, and adding the data to the set of known data; and

prediction weighting means for setting weights for use by said first integrating means to integrate the results of learning.

6. The active learning system according to claim 4, comprising prediction weighting means for setting weights for use by said first integrating means to integrate the results of learning.

7. The active learning system according to any one of claims 4 to 6, comprising data weighting means for setting weights for use by said second integrating means to select data to be next learned.

8. The active learning system according to any one of claims 4 to 7, further comprising group generating means for performing grouping of the known data and the unknown data,

wherein said second integrating means selects data such that the data disperse over groups upon calculation of the data to be next learned.

9. The active learning system according to any one of claims 4 to 7, further comprising:

group generating means for performing grouping of the known data and the unknown data; and

data selecting means for supplying said each learning machine with the unknown data such that the unknown data disperse over groups.

10. An active learning system comprising:

a storage device for storing a set of known data and a set of unknown data, said known data being data having known label values, and said unknown data being data having unknown label values;

a plurality of learning machines for learning the known data and

predicting the unknown data;

a plurality of sampling devices provided for each of said learning machines for sampling the known data from said storage device and supplying the sampled data to said learning machines corresponding thereto;

first integrating means for integrating results of learning performed by said respective learning machines based on the known data;

second integrating means for calculating data to be next learned from results of the predictions performed by said respective learning machines based on the unknown data, and delivering the data to be next learned;

result input means for entering a label value corresponding to the data to be next learned;

control means for deleting the data, the label value of which has been entered, from the set of unknown data, and adding the data to the set of known data; and

data weighting means for setting weights for use by said second integrating means to select data to be next learned.

11. The active learning system according to claim 10, further comprising group generating means for performing grouping of the known data and the unknown data,

wherein said second integrating means selects data such that the data disperse over groups upon calculation of the data to be next learned.

12. The active learning system according to claim 10, further comprising:

group generating means for performing grouping of the known data

and the unknown data; and

data selecting means for supplying said each learning machine with the unknown data such that the unknown data disperse over groups.

13. An active learning system comprising:

a storage device for storing a set of known data and a set of unknown data, said known data being data having known label values, and said unknown data being data having unknown label values;

a plurality of learning machines for learning the known data and predicting the unknown data;

a plurality of sampling devices provided for each of said learning machines for sampling the known data from said storage device and supplying the sampled data to said learning machines corresponding thereto;

first integrating means for integrating results of learning performed by said respective learning machines based on the known data;

second integrating means for calculating data to be next learned from results of the predictions performed by said respective learning machines based on the unknown data, and delivering the data to be next learned;

result input means for entering a label value corresponding to the data to be next learned;

control means for deleting the data, the label value of which has been entered, from the set of unknown data, and adding the data to the set of known data; and

group generating means for performing grouping of the known data and the unknown data,

wherein said second integrating means selects data such that the

data disperse over groups upon calculation of the data to be next learned.

14. An active learning system comprising:

a storage device for storing a set of known data and a set of unknown data, said known data being data having known label values, and said unknown data being data having unknown label values;

a plurality of learning machines for learning the known data and predicting the unknown data;

a plurality of sampling devices provided for each of said learning machines for sampling the known data from said storage device and supplying the sampled data to said learning machines corresponding thereto;

first integrating means for integrating results of learning performed by said respective learning machines based on the known data;

second integrating means for calculating data to be next learned from results of the predictions performed by said respective learning machines based on the unknown data, and delivering the data to be next learned;

result input means for entering a label value corresponding to the data to be next learned;

control means for deleting the data, the label value of which has been entered, from the set of unknown data, and adding the data to the set of known data;

group generating means for performing grouping of the known data and the unknown data; and

data selecting means for supplying said each learning machine with the unknown data such that the unknown data disperse over groups.

15. A program for causing a computer to function as:

storing means for storing a set of known data and a set of unknown data, said known data being data having known label values, and said unknown data being data having unknown label values;

a plurality of learning means for sampling the known data from said storage means, and learning the known data and predicting the unknown data;

first integrating means for integrating results of learning performed by said respective learning machines based on the known data;

second integrating means for calculating data to be next learned from results of the predictions performed by said respective learning means based on the unknown data, and delivering the data to be next learned;

result input means for entering a label value corresponding to the data to be next learned;

control means for deleting the data, the label value of which has been entered, from the set of unknown data, and adding the data to the set of known data; and

weighting means for setting at least one of: weights during the sampling in said sampling device; weights for use by said first integrating means; and weights for use by said second integrating means.

16. The program according to claim 15, further causing said computer to function as group generating means for performing grouping of the known data and the unknown data, wherein data are selected such that the data disperse over groups when said second integrating means calculates the data to be next learned.

17. The program according to claim 15, further causing said computer to function as:

group generating means for performing grouping of the known data and the unknown data; and

data selecting means for supplying said each learning machine with the unknown data such that the unknown data disperse over groups.

18. A computer readable recording medium recording the program according to any one of claims 15 to 17.